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per cent., the maximum error, although of course infrequent, may even be ten per cent. For the reconstruction of the mean capacity of a race, the mean error is about 1.2 per cent., with a maximum error of 2.5 per cent. If these errors appear large to the craniologist, we would remind him that his search for an absolutely correct formula giving cranial capacity from external measurements is the pursuit of a will o' the wisp. The theory of probability shows us exactly the sort of errors such formulæ are liable to, and teaches us how to select the best. The whole basis of the theory of evolution, the variability of one character, even with fixed values for a number of others, would be upset if any such absolute formula were forthcoming. What we have to do is to select a few organs as highly correlated as possible, but, having done this, it has been shown elsewhere that we shall not sensibly decrease the error of our prediction by increasing the number of organs upon which the estimate is based.\* Accordingly we do not believe that sensibly better reconstruction formulæ than those found will ever be forthcoming, for, as we have already observed, we know from Miss Fawcett's wide series of skull correlations that we have practically chosen the organs of the highest correlation. Better data for determining the equations will undoubtedly be available as further craniological measurements are made, or as the great mass already made are quantitatively reduced.

In the last place we turn to the third problem: the reconstruction of the capacity of the living head. The memoir contains tables of the skull capacity of some sixty men, and also of some thirty women, whose relative intellectual ability can be more or less roughly appreciated. It would be impossible to assert any marked degree of correlation between the skull capacities of these individuals and the current apprecia-

tion of their intellectual capacities. One of the most distinguished of continental anthropologists has less skull capacity than 50 per cent. of the women students of Bedford College; one of our leading English anatomists than 25 per cent. of the same students. There will, of course, be errors in our *probable* determinations, but different methods of appreciation lead to sensibly like results, and although we are dealing with skull *capacity*, and not brain weight, there is, we hold in our data, material enough to cause those to pause who associate relative brain weight either in the individual or the sex with relative intellectual power. The correlation, if it exists, can hardly be large, and the true source of intellectual ability will, we are convinced, have to be sought elsewhere, in the complexity of the convolutions, in the variety and efficiency of the commissures, rather than in mere size or weight.

#### AMERICAN ORNITHOLOGISTS' UNION.

THE Eighteenth Congress of the American Ornithologists' Union convened in Cambridge, Mass., Monday evening, November 12th. The business meeting was held in Mr. William Brewster's Museum, and the public sessions, commencing Tuesday, November 13th, and lasting three days, were held in the Nash lecture room of the University Museum.

Dr. C. Hart Merriam, of Washington, D. C., was elected President; Charles B. Cory, of Boston, and C. F. Batchelder, of Cambridge, Mass., Vice-Presidents; John H. Sage, of Portland, Conn., Secretary, and William Dutcher, of New York City, Treasurer. Frank M. Chapman, Ruthven Deane, E. W. Nelson, Witmer Stone, Drs. A. K. Fisher, Jonathan Dwight, Jr. and Thos. S. Roberts were elected members of the Council. By a provision of the by-laws, the Ex-Presidents of the Union, Dr. J. A. Allen and Messrs. William Brewster, D. G. Elliot

\* *Phil. Trans.*, A, Vol. 190, p. 466.

and Robert Ridgway are *ex-officio* members of the Council.

One honorary, two corresponding and seventy associate members were elected.

A change in the by-laws was proposed whereby the present class of active members shall be known as fellows; the present class of associate members to be known as associates, and to establish a class of membership intermediate between fellows and associates, to be known as members. The matter will be brought up for final action at the next Congress of the Union.

Miss Juliette A. Owen, of St. Joseph, Mo., an associate member, who so kindly remembered the Union at the last Congress, sent an additional \$100 this year. This will be added to a fund, the income of which is to be used for the advancement of the science of ornithology.

An address in commemoration of Dr. Elliott Coues, a distinguished member, and a former president of the Union, who died since the last Congress, was delivered by Professor D. G. Elliot. Dr. Coues became eminent in science, and did more perhaps than any other person to stimulate in young people an interest in birds. Dr. J. A. Allen presented a memorial address on the Hon. Geo. B. Sennett, an active member of the Union, who died during the past year. Mr. Sennett, although deeply engrossed in business, never lost his taste for ornithology. His writings relate mainly to the birds of Texas.

The report of the Committee on Protection of North American Birds, read by its Chairman, Mr. Witmer Stone, showed that satisfactory results had been obtained during the past year. One important feature was the protection of the gulls and terns along the coast, made possible by money secured through the efforts of Mr. Abbott H. Thayer. Mr. William Dutcher, who had special charge of this phase of the work, made a supplementary report, giving in de-

tail the localities where the birds were found and eventually saved. These reports will be published in *The Auk*, and reprinted as a separate pamphlet, to be sold at a very low price for general distribution.

Judge John N. Clark's 'Dooryard Ornithology' was a popular and well presented paper. Mr. Clark lives in Saybrook, Conn., and in the restricted area about his house he has noted the occurrence of more than one hundred species of birds.

From letters written to the late Spencer F. Baird, Mr. Witmer Stone was able to obtain, by courtesy of Miss Lucy H. Baird, interesting facts about many of the older ornithologists. These he embodied in an important historical paper called 'The 'American Ornithologists' Union' of 1840-45.' It is difficult to realize at the present time the discomforts and disadvantages that confronted workers in any science sixty years ago.

Two afternoons were devoted to papers illustrated by lantern slides—all showing what an aid photography now is to the study of the habits of birds.

Following is a list of the papers read at the sessions in addition to those already mentioned:

'The Sequence of Moults and Plumages of the *Laridæ* (Gulls and Terns)': JONATHAN DWIGHT, JR.

'A Study of the Genus *Sturnella*': FRANK M. CHAPMAN.

'The Pterylosis of Podargus; with Further Notes on the Pterylography of the *Cypripulgidæ*': HUBERT LYMAN CLARK.

'The Moults of the North American Shore Birds (*Limicolæ*)': JONATHAN DWIGHT, JR.

'Nesting of the Yellow-headed Blackbird.' Illustrated by lantern slides: THOMAS S. ROBERTS.

'Among the Terns at Muskeget, and on the New Jersey Coast.' Illustrated by lantern slides: WM. L. BAILY.

'The Season of 1900 at the Magdalen Islands; with remarks on bird photography.' Illustrated by lantern slides: HERBERT K. JOB.

'Field Notes on a few New England Birds.' Illustrated by lantern slides: WILLIAM BREWSTER.

'Notes on the Spring Migration (1900) at Scarborough, N. Y.': LOUIS AGASSIZ FUERTES.

'Impressions of Some Hawaiian Birds': H. W. HENSHAW.

'A Visit to the Birthplace of Audubon': O. WIDMANN.

'Natural History of the Alaska Coast.' Illustrated by lantern slides: C. HART MERRIAM.

'Notes on a Nest of Massachusetts Brown Creepers.' Illustrated by lantern slides: A. P. CHADBOURNE.

'Bird Studies with a Camera.' Illustrated by lantern slides: FRANK M. CHAPMAN.

'Aptochromatism.' A reply to Drs. Dwight and Allen: FRANCIS J. BIRTWELL.

'On the Breeding Habits of Leconte's Sparrow': P. B. PEABODY.

'On the Value of Careful Observations of Birds' Habits': EDWARD H. FORBUSH.

'Breeding of the Cerulean Warbler near Baltimore': FRANK C. KIRKWOOD.

'The Enforcement of the Lacey Act': T. S. PALMER.

The next annual meeting will be held at the American Museum of Natural History, New York City, commencing November 11, 1901.

JOHN H. SAGE,  
*Secretary.*

#### THE WELSBACH LIGHT.\*

THE Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts, acting through its Committee on Science and the Arts, investigating the merits of the Welsbach Light, which was referred to the Committee by the Jury of Awards of the late National Export Exposition, 1899, reports as follows:

The procuring of artificial light by some means other than using the flame of burning carbonaceous material in the ordinary candle, lamp or gas burner has been the aim of many investigators. As a result of this endeavor, we find on the one hand

\* Being the report of the Franklin Institute, through its Committee on Science and the Arts, on the exhibit of the Welsbach Light Company, of Gloucester City, N. J., referred by the Bureau of Awards of the National Export Exposition. Sub-Committee.—Arthur J. Rowland, Chairman; C. A. Hexamer, Wm. McDevitt, Frank P. Brown, Moses G. Wilder.

lamps in which carbon is heated to a point where it gives off light—or becomes incandescent—as by the passage of an electric current through an incandescent filament or arc lamp crater; or, on the other hand, lamps in which the incandescence of certain substances (oxides of certain of the elements for the most part) is produced by the application of a heating flame or the passage of an electric current to raise their temperature. Of these latter burners, the development of those using a heating flame applied to produce incandescence of rare earths is the particular thing dealt with in this report, but it seems impossible to avoid a mention of others when giving an outline of the chain of discoveries and inventions leading up to the Welsbach light of to-day.

It is probable that Drummond is one of the earliest discoverers of the fact that heated oxides of certain elements incandesce. Certainly he made the first practical application of the fact. Every one knows of the Drummond or lime-light which has been so commonly used in the projection lantern. A piece of lime, or better, a piece of oxide of magnesium, or, most refractory of all, a piece of oxide of zirconium, has an oxyhydrogen flame play upon it and is thereby heated to a temperature at which it incandesces and gives off an intensely-bright white light. Lieutenant Thomas Drummond, in the English government service, made this discovery in 1826, and used it in connection with his heliostat in surveying work, and afterwards proposed the same arrangement for lighthouse service.

In 1868, Le Roux, Professor at the École Polytechnique, Paris, discovered that a brilliant incandescent light might be procured from a rod of lime or magnesia, by heating it until an electric current passes, this afterward maintaining the light.

In 1879, Jablochhoff patented the use of a piece of kaolin as a source of light, making it incandesce by passing an electric cur-